

Socio-Economic Study Category, Appendix G

Study Topic	File Date
Post Mining Land Use Study	3/18/2002
The Mountaintop EIS Technical Report	6/6/2000
Mine Dust and Fumes Study	10/09/2001
Blasting-Related Citizen Complaints in Kentucky, West Virginia, Virginia and Tennessee	7/10/2002
Impact of Blasting on Domestic Wells	6/28/2002
Workshop on Mountaintop Mining Effects on Ground water	9/14/2000
Comparative Study of Structure Response to Coal Mine Blasting – Non Traditional Structures	2/01/2003
Phase I Economics	3/08/2002
Phase II Economics Sensitivity Analysis	12/12/2001 1/13/2003
Case Studies Report on Demographic Changes Related to Mountaintop Mining	8/30/02

These reports are included in the appendix in black and white. Color versions may be viewed on the following website. <http://www.epa.gov/region3/mtntop/index.htm>

Post Mining Land Use Study by Dr. Charles Yuill, WVU

This study is designed to assess the impacts of historic, current, and potential mountaintop removal mining on land use and development patterns in West Virginia. This study, along with other related studies, was designed to answer the following general question:

What are the socio-economic impacts, both positive and negative, associated with mountaintop mining and valley fills? These may include values associated with post mining land use change, removal from market of coal not economically accessible by other mining methods (and associated takings claims), aesthetics, tourism, the heritage of mountain residents, and other factors.

More specifically, the EIS Steering Committee wanted this particular study to determine if changes in land uses following mountaintop mining and reclamation provide marketable lands beneficial to the coal field region of southern West Virginia. The study concludes:

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“Significant additional acreages of land with development opportunities and potentials greater than the potentials that are currently present will result from reclamation in the potential future mountaintop mining areas.” However, the report adds that, “Development limitations such as poor accessibility and infrastructure proximity will continue in nearly all of these areas.” Regarding the prospects for future developed land uses, the study concludes that, “Given current and foreseeable future land use demands, it is unlikely that any more than 2 to 3% of the future post-mining land uses will be developed land uses such as housing, commercial, industrial, or public facility development.”

The study also indicates the scope of land use changes from past, present and potential coal mining:

“Almost 88%, or slightly over four million acres were classified as mature forest land with the diverse mesophytic forest type being most prevalent at almost three million acres of area. All developed land uses (intensive urban, moderately intensive urban, light urban, populated areas, major roads, and infrastructure such as power lines) only accounted for 155,000 acres or roughly three percent of the area. Agricultural land uses were found on approximately a quarter of a million acres or five percent of the area. Other general land use/ land cover categories include: shrub land and woodland areas with slightly over 63,000 acres; water/ wetlands with 56,000 acres or one percent of the area; and barren land—mining being 74,000 acres or 1.5% of the study area. The barren land—mining category significantly underestimates the acreage in mining because it includes only areas that were essentially in bare or nearly bare soil at the time of image acquisition—so it does not include reclaimed areas.”

The report corrected the underestimated mining category of land use as follows:

“Total identified disturbed acreage (all mining disturbances) = 244,664 acres, 5.01% of region. Estimate does not include areas that have been fully reclaimed or converted to a post-mining land use. Current permitted coal mine area in the mountaintop mining region of West Virginia [is] 247,364 acres. Of the total permitted area in the region, over one quarter is in mountaintop mines—the remaining are contour mines, surface areas impacted by underground mines, and coal preparation and cleaning facilities that often contain very large coal waste disposal areas.”

The report shows that 91% of the permitted area had a pre-mining land use of various types of forest cover, with 68% of the proposed post-mining land use area comprising various types of forest cover or wildlife habitat. The report projected from 56,000 to 228,000 acres affected due to potential future mountaintop removal (does not include projections of future contour mining).

However, the reader must be cautioned on the use of specific study data regarding **future** land use impacts due to MTM/VF operations. The future projected mining data provided in the study is based

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on GIS data generated by the “Phase I Economic” study, which was not designed for siting purposes. The Phase I study was also subsequently determined to have limitations because the data did not necessarily represent potential future mining sites and the model was insensitive to localized land uses and mining engineering assumptions. The portions of the study that are not based

The Mountaintop EIS Technical Report - by the Mountaintop Technical Team

This study was designed to determine how coal recovery at proposed mine sites would be impacted if valley fills were prohibited in intermittent and perennial stream segments. Use of alternative methods to mine available coal were analyzed. This study and other related studies were designed to answer the following general question:

If regulatory action limits mountaintop mining and/or associated valley fills, what impacts would the possible alternative mining methods have on environmental and socio-economic resources?

Specifically, for this particular study, the EIS Steering Committee wanted to know the impacts to coal recovery by limiting valley fill construction to ephemeral stream segments. The study concludes:

Of the ten mines examined, coal recovery would be reduced by 78%, if the altered economics of revised mine configurations are not considered. The coal recovery from these sites would be reduced by 86%. A combination underground/contour mine with a coal processing facility was also examined, and the study determined that recovery of coal from this complex is completely infeasible if fills would be restricted to ephemeral streams. Adding the reductions for this eleventh facility, the total coal recovery (compared to the original mine plan recovery) is reduced by over 92%.

The limiting factor of this study was the relatively small sample size.

Mine Dust and Blasting Fumes Study by Dr. Lloyd English, WVU

The study was designed to determine if blasting was causing measurably higher concentrations of dust and fumes outside of the permit area. The study was performed primarily because of public comments and concerns raised during EIS scoping meetings that dust from mine blasts was a significant problem and a health risk to people living in communities adjacent to mountaintop mines.

The study concluded that dust and fume emissions from blasting pose no potential health problems outside of the mine area. Visible and measurable fugitive dust--a quality of life issue--rarely migrated more than 1000 feet from the actual blast.

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The limiting factor of this study is the relatively small sample size and the ability to capture/measure the dust and gas fumes emanating from the blast.

Blasting-Related Citizen Complaints in Kentucky, West Virginia, Virginia and Tennessee by OSM

This survey was adapted for the EIS from a nationwide study of citizens' blasting complaints. The report characterized the nature of the complaints and responsive actions of the regulatory authorities. The survey characterized the nature, number, and disposition of the complaints within the EIS study area.

The survey found 'annoyance' is the most common blasting complaint, followed by damage and water concerns. Dust, fumes, and flyrock were of much less concern. None of the complaints concerned injury to a person, and only one complaint investigation substantiated property damage. Regulatory authorities most often cited coal operators for record-keeping violations.

The limiting factor of the survey is reliance on available regulatory authority records as opposed to site-specific investigations to discern if allegations were legitimate or complaints were appropriately investigated.

Impact of Blasting on Domestic Wells by Daniel B. Stephens & Associates, Inc

The study was designed to investigate possible effects of mining operations on groundwater quality and supply in domestic wells. OSM performed this study to supplement existing studies to ascertain whether blasting operations were having a profound affect on domestic wells and groundwater sources.

Consistent with earlier U.S. Bureau of Mines research, the study found few changes in the water quality and well yield data that could be directly attributed to blasting. Water quality parameters changed slightly over time, but seem to be unrelated to blasting. The report concluded changes were likely the result of sensor drift and mixing of the water in the well due to pump cycling. Well yield and water level remained constant.

The limiting factor of this study is that only one of the original ten wells could be monitored over entire study period.

Comparative Study of Structure Response to Coal Mine Blasting – Non Traditional Structures by Aimone Martin & Associates

The objective of this study was to observe the response characteristics of atypical (e.g., mobile, earth, log, adobe homes) residential structures to blast-induced ground vibration and airblast. The response of these type home to blasts were compared to findings from existing research to determine

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if the atypical residential structures are afforded the same level of protection as typical residential structures (e.g., frame, masonry, etc. homes) under the existing OSM rules. OSM performed this study to supplement current research. The findings are relevant to scoping issues suggesting that large scale blasting conducted as part of mountaintop mining was damaging homes and other structures.

The study concluded that most of the structures responded in a similar way to structures in earlier blasting studies. The structural response (i.e. the amplification of vibrations within a man-made structure as the result of induced ground vibrations) was greater in earth, masonry structures, and two-story camp homes than traditional structures. When these structures are present near coal mine blasting, lower site-specific vibration and airblast limits (provided for in the OSM regulations) may be prudent.

Phase I Economics by Resource Technology Corporation

The study was designed to determine the effects on coal resource recovery from limiting valley fills to certain size watersheds (35, 75, 150, and 250 acres). The study was designed to ascertain the economic effects of various actions and alternatives under consideration to restrict the valley fills. This phase of the study examined the effects on coal resource recovery related to available valley fill disposal sites. The study was also designed to aid in the cumulative impact analysis by identifying areas that could be affected by future MTM/VF construction.

The study concluded that there would be a 17, 23, 46, and 77 percent reduction in coal resources extracted if fills were limited to 250-, 150-, 75-, and 35-acre watershed scenarios, respectively. While the study addressed the questions posed, the EIS Steering Committee found limitations with the study.

Valley fills locations used in the study exceeded the watershed size thresholds established by the study (i.e. fills were placed in watersheds greater than the scenario limits). The Phase I study fill locations were inconsistent with basic engineering principles and typical mining practice to locate fills in valleys as opposed to on hillsides. The impacts to coal resources that may be recovered by future contour mining (as opposed to mountaintop removal) were not considered due to the applied slope-steepness criteria.

Further, the Phase I study relied on consideration of future mining based on areas where past mining had not occurred. A number of the potential mining sites utilized in the Phase I analysis have subsequently been determined to have been mined, consequently overestimating the available future resource for the Phase I scenarios. The study attempted to take into account mining engineering considerations such as overburden ratios, the volume of resource block, topography, etc., to assess resource recovery feasibility. However, the computer model was not designed, nor did the data exist, to account for every critical mining engineering factor, such as coal quality, mineral and surface ownership conflicts, and other very site-specific elements.

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The Steering Committee consequently found that the site-specific results of the Phase I Economics study have limitations and should not be relied on to be representative of potential future mining and fill areas or precise with respect to production change estimates. Methodology, assumptions, and data limitations were presented in a public meeting with stakeholders in Charleston, West Virginia in November 2002 in preparation for the sensitivity analysis described below in the Phase II Economic Study synopsis. Despite the study limitations, the computer modeling clearly indicates a trend related to reduction in available valley fill storage and the amount of coal reserves recoverable. The study illustrates, from a regional modeling perspective, that restricting valley fills to small watersheds would commensurately restrict mining feasibility and minimizes full resource utilization.

Phase II Economics by Hill and Associates

This study was designed to utilize the results of the Phase I economics study; i.e., what impacts will valley fill restrictions and the reduced ability to recover mine coal resources have on coal prices, coal production, electricity generation/pricing, mining employment, and tax losses. The production reduction numbers generated by the Phase I Economics Study of RTC (described above) were input with Hill and Associates proprietary information and models. The Phase II Economic Study projected that, overall, the price of coal would continue to fall in the study area and fill placement restrictions would raise the price of coal by approximately \$2.50-\$3.50 under the most restrictive scenario (fills limited to 35-acre watersheds) over the base case “no constraints” scenario. However, in most situations the restriction would change the price of coal to less than one dollar per ton. The most restrictive scenario would, under the worst condition, cause up to a 20 percent reduction in direct coal mining employment in the region. The total electricity generated in the region would also be affected by fill restrictions. Under the most restrictive scenario, electricity production would be reduced by 11 percent over the base scenario. Generally, electricity production reduction would range from 2 to 6 percent in most years, because of the restrictions. The price of electricity would continue to rise approximately 1 to 2 percent across the scenarios; the impacts due to restrictions will have little effect on price.

Because the Phase II Economic Study used the results of the Phase I Economic Study, the study results also have limitations. The EIS Steering Committee sanctioned a sensitivity study by Hill and Associates to evaluate these limitations. The sensitivity study was designed to determine how results of the initial Phase II study would change if a different set of Phase I assumptions and inputs were used. Modeling inputs, drawn from mining experience were used to indicate the direction and the magnitude of Phase II study output change resulting from adjusted sensitivity inputs.

In the original Phase II study, no adjustments in costs were made to reflect changes in material handling and haulage methods resulting from fill restrictions. The costs were also not adjusted to reflect the reality that fill restrictions would likely necessitate a change from large mining equipment to smaller equipment. A shift from fewer larger fills to many smaller fills would require construction costs for additional sediment ponds—not part of the initial Phase II assumptions. Finally, the initial modeling runs in the Phase II Economic Study did not project an increase the

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required return on investment (ROI) capital, which was estimated to be as high as 20%percent. This unwillingness to invest, because of perceived increased risk, occurs largely due to regulatory uncertainty. These factors were used in adjusting the modeling sensitivity runs to reflect higher mining costs and lower mine capacity and reserve recovery.

The sensitivity runs confirmed earlier results indicating that coal production was sensitive to lower reserve recovery due to smaller fills. Production decreased by approximately 20 percent over the initial study results. The price of coal was somewhat sensitive to the model assumption adjustments, reflected by approximately \$2.00 more per ton under the most restrictive scenario over the base scenario. This impact is double that of the original Phase II run for the same scenario. The change in ROI had very little impact on the results.

Case Studies Report on Demographic Changes Related to Mountaintop Mining by Gannett Fleming, Inc

The purpose of the study was to evaluate what, if any, demographic changes can be observed in communities located adjacent to large-scale mountaintop mines. The study concluded that population, family income, and levels of employment have declined since the 1970's. Personal accounts by a sample of residents attributed these changes with the onset of mountaintop mining; however, the control areas where no mountaintop mining occurred showed some similar demographic shifts. Therefore, the limitations of the study are that the conclusions of demographic shifts due to mining are based on perception. The shifts may actually be attributable in part or more directly related to complex Appalachian societal, generational, economic, governmental, and quality of life issues and factors.